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A PERSPECTIVE ON COMMISSIONING AND EDUCATION--TOTAL QUALITY, TOTAL FORCE

by

Ronald D. Reed, PhD
Lieutenant Colonel, USAF

A RESEARCH REPORT SUBMITTED TO THE FACULTY

IN

FULFILLMENT OF THE CURRICULUM

REQUIREMENT

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ABSTRACT

TITLE: A PERSPECTIVE ON COMMISSIONING AND EDUCATION--TOTAL QUALITY, TOTAL FORCE

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Internal and external pressures drive leaders, planners, and senior decision makers to evaluate educational programs for efficiency, effectiveness and long-term benefits. This paper focuses on such issues with respect to Department of Defense (DOD) commissioning programs. Meshed with older educational concerns for development and reform, a growing emphasis on Total Quality Management (TQM) offers opportunities and challenges in meeting such pressures and in supporting evaluation. TQM areas of particular importance in tailoring TQM to commissioning programs are customer and product identification, quality definition and measurement, leadership and teamwork in organizational culture, and benchmarking. Data is needed to support decision making and program improvement at all levels. Several metrics of comparative quality are available, with one being surveys of supervisors for newly commissioned officers. A case is made that better coordination of evaluative data and commissioning programs is needed. Ultimately, this coordination should extend within each service, across the joint services, and through career-long professional military education.

BIOGRAPHICAL SKETCH

Lt Col Ronald D. Reed (PhD, University of California, Berkeley) began his career as a scientist and manager in Air Force research and development. He has also been an educator in the Department of Biology at the US Air Force Academy for over eight years. Among his duties there he was the Deputy for Academic Development for the Department of Biology and the Director of New Instructor Training for the Dean of the Faculty. He has a long-standing interest in faculty and curriculum development but claims no expertise in the behavioral sciences or rigors of educational evaluation. While a student at the Air War College, Lt Col Reed has pursued advanced studies in the area of Total Quality Management and its application to the Department of Defense.

Lt Col Reed will begin duties as Permanent Professor and Head, Department of Biology, US Air Force Academy, upon his completion of Air War College in 1993. The thoughts in this paper do not reflect an official opinion of the Academy. Rather, they reflect the author's efforts to survey literature in this area and to build an understanding of key issues facing senior decision makers, to integrate ideas and to expand his own perspective of educational improvement in service to the individual and the nation.

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CHAPTER I

INTRODUCTION

Objective and Scope

Internal and external pressures drive leaders, planners, and senior decision makers to evaluate educational programs for efficiency, effectiveness, and long-term benefits. This paper will focus on such issues with respect to Department of Defense (DOD) commissioning programs. It will be seen that Total Quality Management (TQM), as a broad philosophical framework with an emphasis on practical tools for decision making, poses unique opportunities and challenges to support such evaluation. A key factor in grasping these opportunities and meeting these challenges is having a clear, renewed frame of reference among commissioning sources reflecting DOD and educational TQM initiatives. Further, successful evaluation efforts require meaningful information to support decision makers at all levels.

The fundamental purpose of evaluation in TQM is improvement, and this paper will examine TQM concepts that can foster improvement within and among military services. These concepts include product and customer identification, quality definition and measurement, leadership and teamwork in organizational culture, and competition or benchmarking from a commissioning perspective. It will highlight the need for comparable, comprehensive evaluation among commissioning programs with an understanding that these programs have both common and unique aspects compared to each other or civilian counterparts. The

paper will also summarize aspects of program evaluation and discuss how tools for evaluation have the potential to help integrate commissioning programs.

In focus, this paper will deal primarily with the US Air Force Academy (USAFA) as it relates to other Air Force and DOD commissioning sources; total-force concepts will extend issues within and among services. The paper will further focus on the academic environment rather than administrative or support areas. In scope, it will explore some current issues while giving a basis for further discussions by decision makers and workers in the field. Due to the complexity of the issues, it must remain a survey in character, providing background and supplemental appendices without becoming a primer in assessment, TQM, or other areas. In the end, this paper will have moved between broad issues and specific tools in an exploration of ways to achieve total quality in total-force commissioning, a goal needing renewed emphasis now.

Background--Commissioning and Education

Commissioning within DOD centers on production programs from three primary services, Army, Navy, and Air Force. In this simplified view each service has three main avenues available: 1) short-term, short-notice training through Officer Candidate School (OCS), Officer Training School (OTS), and equivalent programs in which military training is intense but there is little educational broadening; 2) Reserve Officer Training Corps (ROTC) programs combining federally funded military training with partially funded civilian academic programs; and 3) four-year, self-contained service academies providing a full spectrum of academic education and military training along with athletics and other broadening programs.[1] OCS/OTS is sometimes seen as a flexible, readily expandable source of officers that has a secondary benefit of offering an avenue

to commissioning by enlisted people. ROTC is seen as another flexible, expandable source of commissioned officers with broad civilian perspectives and specific skills, as well as being an ongoing civil-military link in our society. The service academies are seen as a controlled, reliable source of career officers with more in-depth, integrated education and training to meet long-range national needs and, in many eyes, to set the standards of military professionalism in their services.[2]

Exceptions and additions to this simple view are many. For example, the Naval Academy provides Marine Corps officers, but Marines also have their own training programs, as do other uniformed services. Within the Air Force and other services there are added, special commissioning programs through such avenues as the Air National Guard (the Academy of Military Science) and the medical specialty field (Military Indoctrination for Medical Service Officers).[3] Further, academy cadets may choose to cross-commission or transfer into another service branch, as may some ROTC cadets. Ultimately, each commissioning program is unique in scope and its focus on service- or mission-specific issues. Still, cross-commissioning and the common purpose of commissioning new officers imply that although there is program uniqueness, there is also some unity of goals, education, and training.

Within the spectrum of education and training given by commissioning programs, education *per se* involves broader, less quantifiable goals linked to the mastery of academic disciplines, the achievement of critical cognitive capabilities, and the evolution of social or other values. Commissioning training has been seen as a combination of "hard" and "soft" (narrow or broad) aspects, where the less quantifiable areas in broad training (officership, etc.) blend into the general framework of education.[4] In evaluating and improving

commissioning programs, the effectiveness of narrow training may be measured by the performance of selected (often psychomotor) tasks, but the effectiveness of programs with broader goals is more difficult to measure. As an example of broad goals, USAFA has worked since 1992 towards a mission to "develop and inspire air and space leaders with vision for tomorrow."[5] Comparable missions for other commissioning programs are given in Appendix I--they set a range of goals affecting program evaluation and improvement. Devising and implementing effective evaluation programs becomes more difficult as goals become less tangible, whether within each commissioning program or among them.

The evaluation and integration process has broader implications than in improving individual or common curricula. It relates to overall force structure and our ability to weigh the costs and benefits of commissioning officers from different sources within and among the services or between commissioning sources and civilian educational institutions. In fact, there is little concrete data to compare the quality of officers from each source or to foster program improvement. The General Accounting Office (GAO) concluded in 1991 that the "services have done relatively little research to formally assess the quality of officers produced through the various commissioning programs."[6] The Assistant Secretary of Defense (Force Management and Personnel) was forced to concur in principle with this criticism.[7] In exploring TQM as a focus for better evaluation, leading to program improvement and integration, this paper will first examine the context of pressures for such evaluation in education and commissioning.

CHAPTER II

PRESSURES DRIVING EVALUATION

Several factors drive a desire and need for evaluation of the educational process and its output, factors that are viewed as both internal and external to the educational system.[8] Such factors also apply to the commissioning environment and are augmented by unique factors in that environment.

Internal Pressures

Internally, there has long been an institutional and individual desire for improvement in curricula and educational technique.[9] Bogue and Saunders noted that the leadership of academia has always asked questions of purpose or performance, as do other leaders.[10] The professionals who educate do the same, as reflected in movements to capitalize on new educational technologies or debates on educational philosophy and technique. As educators work to perfect their skills and art, the primary focus of such efforts remains on the student. Thus, a coupled pressure driving educational evaluation has been the desire for student development towards a variety of goals. Different teachers may have different views of the proper student-teacher relationship or learning model, yet the drive is fundamental to the act of teaching.[11]

The needs and desires of the student can also be seen as an internal pressure driving evaluation and improvement in education. These needs and desires may be expressed individually or collectively during the students' participation in the educational system; after graduation other avenues, such as

alumni associations, can aid this expression. The influence of these needs and desires on the educational system varies over time, again depending on institutional and individual views of the student-teacher relationship.

Other internal pressures are administratively driven, such as the need by organizational planners to make comparative evaluations and resource trade-offs among departments or programs in times of decreased resources. Such decreased resources can also drive educators to evaluate their programs for ways to be more efficient and effective by modifying teaching techniques to deal with decreased budgets, teacher shortages, and other constraints.[12] Much can be written about the core internal pressures for educational evaluation and improvement, but the emphasis in recent years has been to place them in a larger context of increasing external pressures on the educational system.

External Pressures

Externally, there are many pressures on educational institutions for accountability regarding their performance, coupled with demands for increased oversight and management access. At the individual level, in the role now of a potential "customer," students demand an education responsive to individual needs and perspectives at a reasonable cost.[13] Parents, taxpayers, corporations, and others who may help finance education demand return on their investment.[14] Reinforcing such demands from the public sector has been a perceived decline in US schools and the capabilities of our graduates regarding literacy or other critical skills, creative thinking, social values, and the relative ability to support economic development and adaptation to technological or other change.[15]

Facing such demands and perceptions, colleges and universities increasingly must compete with each other, as well as with corporate and foreign

educational alternatives, for a pool of new and returning students.[16] Commissioning programs also must compete in this environment. Since commissioning programs are linked to overall military recruiting, this is especially evident as military forces are reduced and military careers may seem less attractive. Despite a prestige that attracts a surplus of candidates, at USAFA this factor has been augmented by such negative signals as decreased numbers of pilot training slots and, in FY92, legislation that decreased the overall class size and attacked traditional incentives such as the granting of a regular commission to graduates (a commission favored over a reserve one because of increased career potential or security).[17] It can be expected that future officer candidates will carefully examine the value of commissioning programs versus other education, employment, and national service opportunities.

Added to such "market-oriented" external pressures for accountability are those from government officials. Increasingly, local, state, and federal governments have seen the oversight of education as a legitimate function requiring decisions based on educational outcomes.[18] Central to oversight are issues of responsiveness to the needs of the community, standards of quality, and the cost-benefits of different institutions or teaching strategies affecting the investment of public resources. President Johnson's War on Poverty was seen by some as a watershed in focusing attention and funds on education, along with demands for accountability and evaluation.[19] Similarly, President Bush worked with the Department of Education in 1991 to reemphasize that our schools must be improved and must develop "an emphasis on accountability--setting goals, objectively measuring progress towards these goals, changing what doesn't work, and rewarding what does."[20] The new administration can be expected to continue this trend towards accountability linked to evaluation.

Related to such issues are cost-related concerns that intensify with decreasing resources. Cost analysis is a "policy-oriented dimension of evaluation" to help policy makers allocate resources to maximize outcome for given input.[21] Cost-effectiveness and cost-benefit analyses derived from public sector initiatives. Thus, cost-benefit analysis (which can include broader, long-term effects of a program) was developed in the 1930s to help Congress evaluate water-resource projects proposed for the Army Corps of Engineers. Cost-effectiveness analysis was developed for DOD in the 1950s to help analyze the relative merits of weapons systems, roles and missions.[22] Levin has noted that difficulties in such cost-related studies include the need to quantify multiple, often vague, objectives as well as the requirement to deal with imperfect information and a lack of understanding among policy makers about the method.[23] Even so, cost studies now are fundamental in accountability efforts.

Such issues of government accountability have a strong impact on commissioning programs. For example, cost-benefit issues have been one factor in the Congressional review of officer accessions and in decisions regarding the size, structure, or even existence of various commissioning sources. DOD spends over $1 billion annually for commissioning programs, a sum earning growing Congressional oversight.[24] The service academies are seen as the most expensive commissioning sources, with estimated costs per graduate ranging from about $153-228,000 at the academies compared to $53-58,000 for ROTC scholarships and $15-$20,000 for OCS/OTS training.[25] USAFA and West Point, in particular, were scrutinized by the GAO in 1991 regarding costs per cadet and the benefits of that cost.[26] Subsequently, the Secretary of the Air Force recommitted USAFA to being a "cost effective source of dedicated, high quality officers for the nation."[27] As USAFA and other commissioning sources seek to reaffirm their

merits to senior decision makers, legislative trends for the time being retain diversification of investment among commissioning sources and their unique capabilities and benefits (whether functional or political).[28]

The issue of cost-benefits is not the only Congressional issue with commissioning programs, just as Congress has expressed interest in broad-ranging civilian processes or outcomes. Other issues include the cultures of the commissioning programs and, indirectly, their success at developing less tangible social or leadership characteristics--issues such as hazing and sexual or racial harassment.[29] Additionally, there can be curriculum concerns, such as the amount of joint service education received in an increasingly joint-operations world. In FY92 and FY93 Congress questioned the merits of the USAFA educational model of an all-military faculty compared to the more civilianized model at Annapolis or to civilian schools in general.[30] Congress also directed the Secretary of Defense to establish uniform reporting and oversight procedures for the academies and to determine where they fit in the command structure.[31] Reports from the Secretary of Defense to Congress are due this year.

Whether higher DOD and service headquarters should be considered internal or external pressures depends on one's perspective. Although a corporate vision is needed for program integration, from the view of planners within individual programs these may appear to be external. Current pressures for evaluation at the DOD level have centered on the Directorate for Accession Policy. DOD holds coordination meetings, such as one slated for May 1993 among ROTC programs. It also considers some initiatives, such as one considering joint training for the first two years of all four-year ROTC programs.[32] As will be seen, most coordination and evaluation has otherwise been left to the services. Within the Air Force, reorganization efforts focused in 1992 on The Year of Education and

Training. One headquarters initiative was an idea of placing all commissioning sources under the newly formed Education and Training Command, an idea echoed in Senate Armed Services Committee discussions.[33] This initiative was not implemented for USAFA, but the potential remains for a single command-level manager to weigh differences in the educational programs, goals, and outcomes of all commissioning sources.

Another pressure driving evaluation of commissioning programs is represented by the organizations and supervisors to which commissioned officers are assigned. These units set limits on the acceptability of officers in certain categories or of supporting educational programs (i.e., qualifications for medical or civil engineering fields), may take part in hand-picking specific officer candidates for inclusion in their career fields, and may provide feedback based on their impressions of the officers they receive. Commissioning programs have a direct responsibility to fill the needs of the units that receive their graduates. This pressure will be discussed more later regarding customer relations of civilian and commissioning educational programs under TQM.

Finally, individual officers, in parallel to their civilian counterparts, may provide feedback upon graduation and throughout their careers that lends information for program improvement. In helping to build officership and career motivation into their graduates, commissioning programs hope to foster qualities that will last throughout a career and beyond. Thus, the opinions of graduates become a strong pressure regarding program success and direction.

All such factors, internal and external, exert pressure on commissioning sources for continuous evaluation coupled to a program of organizational introspection, improvement, and change. TQM, as seen in its growing integration into US management practices, is a way to focus such evaluation.

CHAPTER III

TQM--FOUNDATIONS IN DOD AND EDUCATION

Along with earlier pressures, the use of TQM philosophy and practices DOD-wide can be seen as another factor driving evaluation in commissioning and education programs. This factor can be considered an external one, as it is advocated from senior business and government levels. It is also an internal one, as it is accepted and applied at the organizational level. With elements of both internal and external pressures, then, TQM helps merge the demands of these pressures for improved evaluation and integration. Concurrently, it helps merge management activities seen both in DOD and civilian education.

National and Government Directions in TQM

TQM is becoming a widely adopted national way of pursuing business. This adoption resulted mainly from the success of TQM in Japan, where its foundations were laid by American advocates such as W. Edwards Deming and Joseph M. Juran in the early 1950s and were built on by such Japanese experts as Kaoru Ishikawa.[34] In contrast, US companies for many years focused on short-term profits, assumed tradeoffs between quality and cost, and secure markets for their products backed by management based on "bottom line" figures, mobile managers, and rating of employees in meeting set goals.[35] Now, with increasing global competition, US companies are turning to "quality" as a way to improve processes and products.

Key concepts of TQM are a development of long-term organizational vision, commitment to continuous improvement (the Japanese concept of *kaizen*), a focus

on customer needs and satisfaction, benchmarking or comparison against the best in the field, eliminating coercive management tools and fear among employees, and the training and empowerment of employees to do their best work. Many TQM concepts build on prior management principles of decentralized, participatory management.[36] TQM consultants and analysts have now enumerated such concepts for widespread use, concepts that are applicable here (Appendices II-VI).

Milakovich has pointed out that government organizations mirrored many faults of US business after World War II.[37] Yet, governments faced pressures similar to business: decreasing resources, a need to improve productivity, lack of customer satisfaction, trouble retaining qualified workers, and interagency or global competition. Now the focus on TQM seen in business, health care, or other organizations is mirrored in government.[38] In 1989 President Bush stated, "Reasserting our leadership position will require a firm commitment to Total Quality Management and the principle of continuous improvement. . .Quality improvement principles apply. . .to the public sector as well as private enterprise."[39] The US *Federal Total Quality Management Handbook* now defines quality as "meeting the customer's requirements, needs and expectations, the first time and every time" and outlines principles of government-wide TQM use.[40]

Difficulties do exist in implementing TQM principles in the government. For one thing, politicians often focus on near-term political rewards when distributing national resources. Politicians also must deal with complex, conflicting goals and constituencies, the realities of compromise, and the need to evaluate programs whose success or failure is subject to multiple interpretations.[41] Bureaucracies can resist change and, further, the tenure of senior leaders may be short (not just in Congress, but averaging only 24 months for an assistant secretary in the federal executive department), thus degrading

constancy of vision and support. Despite such factors, many organizations within local, state, and federal governments have applied TQM principles to their operations and benefited by doing so.[42]

Likewise, DOD has worked to implement TQM, making it DOD's official management improvement system in 1988.[43] This movement overlays earlier DOD efforts for quality "control" via other management systems and helps respond to decreasing budgets, rapid technological change, and a need to reexamine customers and missions in a shifting global paradigm.[44] As applied in DOD:

> Total Quality Management (TQM) is both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organization. TQM is the application of quantitative methods and human resources to improve the material and services supplied to an organization, all the processes within an organization, and the degree to which the needs of the customer are met, now and in the future. TQM integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach focused on continuous improvement.[45]

DOD-wide implementation of TQM makes its integration into commissioning programs in accord with other DOD activity, as does its current application to education.

TQM Linkages to Education

TQM's adaptation and application to the educational system is still evolving from early, variable efforts as more institutions build and compare programs.[46] Many TQM concepts work synergistically with such prior internal educational efforts as curriculum and faculty development or assessment. Others have been applied in administrative and infrastruture areas to improve service and support of educational processes. Yet, implementation raises unique issues.

Among these issues is that of defining the product and customer, for in TQM the needs of internal and external organizational customers must be met. White argues that both students and employers of graduating students are

customers, of which the most vital is the student (with student skills setting a demand for future university services and graduates). He feels that academia's key product is the education it provides.[47] From another perspective, students (in gaining an education and then representing the educational process) have been seen as both customers and products--in both capacities defining quality for an institution.[48] Going further, in actively participating to acquire their own education students become at one time part of the process, the chief products, and primary customers. Parents have been equated to customers or as an "educational equivalent of stockholders."[49] Other external customers may include local communities, grantors, industry, legislatures, boards of education, other educational institutions, alumni, and the nation in abstract.[50]

The issue of product and customer identification is complicated by other goals seen in educational organizations beyond teaching well, such as community activities and faculty scholarship or research.[51] A growth of research-centered universities has, for some, made research prestige a major goal, research productivity a major output, and research grants a major input to solvency. White and others argue that research needs of professors are less important than academic needs of students and that the process of research in education may be more important than its results. This argues against any academic culture in which professors see the institution as existing to serve their goals rather one in which they function to provide a service to students.[52] Still, in such cases as land-grant colleges, research or other goals may be part of the mission.[53] Tension remains as the relationships of all internal and external suppliers and customers in a TQM framework evolve and are debated in academia.

Another cited issue is the impression that TQM infringes on traditional cultural norms found in academia, a model typified by departmental autonomy,

individual diversity, academic freedom, and a professional elitism or disciplinary specialization that resist change.[54] Such characteristics, in a narrow sense, run counter to teamwork concepts in TQM. Removing these barriers or placing them in a cooperative context is one educational reform that is part of the TQM movement. Thus, support for individuality and academic freedom need not endorse poor teaching, nor do department autonomy and decentralized program execution bestow the right to ignore broader goals of a core curriculum.

A related barrier is suboptimization or parochialism among departments and campuses due to disciplinary and program loyalty or competition for students and funding.[55] The degree to which this effect is counterproductive requires a vision of total mission. Juran has stressed that top leaders must recognize "all major quality problems are interdepartmental" and pursuit of local goals can undermine overall effectiveness.[56] Likewise, Deming urges intracompany cooperation to maximize benefits to the organization and its customers rather than setting up divisions or departments as competitive profit centers.[57] The same can be said in academia. Successful programs do exist to restructure and integrate academic programs. One well-known effort, begun in 1973 by Alverno College, fosters curriculum-wide abilities in communication, analysis, problem solving, valuing, social interaction, involvement, environmental responsibility, and aesthetic response. Such programs must ensure "the curriculum is a collaborative effort which transcends departments and divisional structures."[58] One technique to build such unity of effort is by forming quality circles (joint working groups) to pool knowledge, effort, goals, and commitment.[59]

Variation is another issue. Reducing process variation to achieve product consistency under TQM might seem appropriate in business but not in producing works of art or creative individuals. This has caused some educators to balk at

a production metaphor for education rather than a transactional or "handmade" one.[60] There are inherent differences in students, faculty, or infrastructure--a common variation in the educational process, but a variety or diversity that is actively sought. Flexible, tailored curricula for individualized learning, augmented by computerized instruction, can help cope with and build on this diversity rather than eliminating it.[61] Where reducing variation may apply in academia is in ensuring that standards of achievement and teaching quality are set, and that all students and teachers are inspired and assisted to reach them. Reducing variation can mean ensuring that prerequisites for one course are reliably taught in preceding ones.[62] Reducing variation for broad goals such as creativity or critical thinking does not imply a rigidity of mind, only that students reach a level of capability in these areas--a level enabling them to express those capabilities with individuality. Any externally applied standards for accountability also should fit within this framework.[63]

A final, fundamental issue is defining and measuring quality or academic excellence in programs with broad educational goals.[64] One early problem seen by developers of educational evaluation systems was that such "programs have many aims--often as many aims as there are stockholders. Programs have fuzzy borders, so that it is not always plain sailing to determine precisely what the program *was* that required evaluation."[65] Linked to difficulties in defining programs is gauging their success through measurement and analysis, which are critical to TQM and its support of continuous improvement. Intangible endpoints are hard to measure, yet both traditional educational assessment and TQM are data-driven.[66] It is fortunate that academia has a well-established emphasis on evaluating and improving its programs. This foundation has many linkages and synergies with TQM, with one example given in Appendix VII. Yet, educational

evaluation as a field of disciplined study only began this century.[67] Metrics are still evolving, and in this evolution several distinctions must be made.

First, will data be related to process input or output? For example, program costs are widely sought input data. However, costs are only part of a larger picture, and they may not be easily definable or comparable, especially when there is no uniform reporting guidance.[68] Other input data can include hours spent in class, teacher-student ratios, length of readings, or credentials and training of teachers. Assessing input data assumes its correlation to ultimate output, but care must taken that institutional and learning processes support such a linkage. Thus, the number of PhDs on a faculty has less meaning if they teach poorly or if those actually teaching in class are only graduate assistants. Output data can also be diverse, including test scores, the number of graduates or degrees obtained, national honors, survey results, and student portfolios of creative works. Various sources of data are in Appendix VIII.

Second, will data be subjective or objective, qualitative or quantitative? TQM emphasizes quantitative data, but care must be taken to avoid measuring what is easy (e.g., number of lessons or readings, length of readings, faculty credentials, curriculum content, test scores, contact time) instead of seeking measures of real performance relevant to goals and analyzing processes to achieve those goals. TQM principles also identify quality as what is perceived as such by the customer(s), necessitating some subjective evaluation. Subjective data increases the flexibility and scope of evaluation and can "provide richer and more relevant information" than purely quantitative data, but it is susceptible to bias and may be viewed skeptically.[69] One can "quantify" subjective data, as shown in systems analysis and TQM metrics, but in converting subjective assessments to quantifiable data (as in building rating

scales for surveys or course critiques) care must be taken in considering the appropriateness of the conversion along with associated biases or assumptions.

Third, who should be setting criteria by which to evaluate academic performance, internal or external sources? Self-assessment advocates note that the most meaningful, most useful criteria are internally generated.[70] Still, some criteria, such as cost criteria, may be externally driven. Further, even if criteria are internally generated, they may be externally reviewed--often accreditation or other program review organizations build their evaluation based on internally generated goals criteria. This basic question of who requires, acquires, and acts on data also relates to its ultimate function.

Fourth, then, will data be for summative or formative purposes? These terms were first used in 1967 to distinguish two roles of evaluation: formative evaluation supports process improvement; summative evaluation serves any other purpose, whether to support policy decisions or to provide data for research.[71] Normally, formative evaluation is internal and summative is external, but this is not always true. Changes in classification can occur, as when a summative evaluation spurs improvement or when a formative evaluation is distributed and used for summative purposes--it is a question of context.[72] The focus in TQM is on formative evaluation. Summative evaluation, in contrast, can spark counter-productive anxiety in an organization; yet it is a reality in education and government, a reality linked to pressures for accountability seen earlier.

All forms of evaluation, all metrics and data, can play a part in TQM. The challenge of evaluation in education is much the same as in any TQM endeavor. That challenge is to find meaningful measures of merit relating to program goals, measures that can be understood by decision makers and can be used primarily for program improvement.

CHAPTER IV

TQM AND COMMISSIONING--ISSUES, CHALLENGES, AND OPPORTUNITIES

TQM and The Culture of Commissioning Sources

At the crossroads of DOD and academia, commissioning programs can apply TQM as a frame of reference to deal with both internal and external pressures for evaluation. Indeed, these programs have already included TQM principles and practices in their operations. For example, in 1991-92 USAFA embarked on a broad review of its curriculum and teaching techniques in an effort linked to TQM application.[73] The Naval Academy also has a strategic plan under the banners of Total Quality Education (TQE) and Total Quality Leadership (TQL).[74] Such efforts do not mean that TQM can be applied without tailoring it to the commissioning environment. That the culture and goals of military commissioning programs are different from academic counterparts provides the first of many issues, challenges, and opportunities.

As noted earlier, commissioning programs are a combination of education and training, with the emphasis varying among commissioning sources. Academies are able to seek broad cross-curriculum synergy between education and training; other commissioning sources are limited by time and resources. All civil and military educational systems, though, face a similar problem in defining quality. This is especially true when long-term benefits of education are examined rather than short-term knowledge or skills. Voorhees has noted that the problems in academia of measuring the "success, failure, or adequacy of

investment" in achieving academic excellence parallel problems of the military in measuring its success at achieving national security, a parallel extended by their public funding and accountability to the nation.[75] As such, commissioning sources are again at the crossroads--one must judge both their ability to educate and their long-term contribution to national defense.

A recent issue facing USAFA is the role and relative merits of civilian and military faculties, an issue not faced by academia. Conflicting goals exist regarding the desire to give students professional military contacts and current insights (favoring military faculty on a rotating basis) and long-term expertise and commitment in academics (favoring stable military or civilian faculty).[76] In 1992, the Air Force followed Congressional guidance to begin civilianizing its faculty to the 50% level.[77] This will change an organizational culture represented in past USAFA guiding principles as a "community of soldier-scholars."[78] Despite concerns that this move will damage USAFA's goals and values,[79] this culture must now adapt not only to comply with Congressional intent but also to build a new teamwork for improvement in consonance with TQM.

Further regarding the cultures of academia and military, some authors have felt that typical academic independence and lack of leadership training may be at odds with the strong culture, leadership, and teamwork vital to TQM.[80] Here the military may be ahead in training and temperament, though many colleges are disproving such stereotypes. Certainly, participatory leadership found in academia may be quite applicable to TQM; and autocratic or adversarial styles, whether in academia or elsewhere, can damage the learning and TQM environment.[81]

The unique culture and missions of commissioning sources affect their comparability and limit application of TQM-linked concepts of competition and benchmarking. Comparing service academies to civilian institutions (the "free

market" of academia) has limitations. As noted, commissioning sources compete against civilian institutions for students; but only USAFA competes on the equivalent basis of offering a baccalaureate degree. Even so, academies are not research oriented and their mission includes other programs interwoven with academics that take cadet time.[82] If other commissioning sources compete with civilian institutions, it is more in the area of offering career opportunities. With or without direct competition, though, benchmarking remains a key to improvement by seeking models of excellence and learning from them.[83] In this context, it is doubtful that any single civilian institution can act as a model for the USAFA process. Certainly, there are models (such as Alverno) for integrating key concepts or values across a curriculum. There are also superb disciplinary models for academic departments, though models with narrower goals and greater resources. There are vocational or other models that integrate education and training. All these may be of use. A more sensitive question is how commissioning sources should view each other in terms of competition and benchmarking. This will be discussed later regarding total-force commissioning.

Multiple Customers and Requirements, Products and Responsibilities

As seen, several authors cite students as the primary customers of the educational system, as well as part of the process and a key product. As in academia, external pressures on commissioning programs can also represent customers. Depending on one's vision, an extended list of such customers may include: the nation as a whole, Congress and other agencies representing the government or taxpayers, the military services, initial and follow-on units to which graduates are assigned, students or graduates, foreign students or graduates and their governments (with whom USAFA, for example, provides one

avenue of politico-military contact), and even planners of career-long professional military education such as Squadron Officer School.

Commissioning programs may be ahead of academia in feeling the immediacy of their many customers and focusing on their needs. Certainly, these programs were founded on service to country and are accustomed to both military and civilian oversight. Another reason these programs may be more focused on the customer is that officers in commissioning programs know they are helping build not only graduates, but colleagues in a profession and perhaps combat.[84] These instructors or planners are thus representatives of a key external customer. This situation may be a parallel to civilian education in specialty fields or preparation for advanced degree training and professional service. Such cultural issues complicate producer-product relationships, though one still cannot submerge the classic educational needs of the student.

At the same time, just as universities have secondary products, so do commissioning sources. Service academies in particular may engage in research and consultation, functions not detailed in formal mission statements though they may be supported with funds and such facilities as the Seiler Research Laboratory collocated at USAFA. The mission of USAFA remains rightfully focused on its cadets, but the faculty job description used for Officer Performance Reports also emphasizes consultation and research for the Air Force and DOD. This implies a broader vision of USAFA, as an ongoing resource of expertise in addition to a source of commissioned graduates. Beyond this, military supervisors at commissioning sources are committed to the professional development of their officers. This has led some, at least at USAFA, to refer to departing military instructors as the "second" graduating class each year--another set of customers or products on active duty, another set of officers the

Academy must serve and by which it is judged. Again, priorities for secondary products or missions must be balanced within an overall organizational vision, an area where problems facing service academies parallel those facing academia.

Evaluation and Total-Force Commissioning

Having seen educational and TQM linkages to commissioning programs, what are the needs and prospects for integrating these programs in a TQM framework? Within the services, Air Force programs are coordinated at the Air Staff level. A Commissioning Education Memorandum of Understanding (CEMU) among commissioning sources sets common education and training goals focused on officership.[85] A Commissioning Education Committee (CEC) meets biennially to revise the CEMU and support cooperative research among the programs. The CEC focuses on broad goals, not metrics; and program evaluation has been left to each commissioning source.[86] The Army has had a Lieutenant Accessions Requirements Working Group since 1988-89 to provide some similar coordination.[87] According to other-service and DOD counterparts, in late 1992 the Navy reduced Pentagon-level coordination efforts and moved or eliminated comparable points of contact.[88]

There has been less active management or oversight by DOD offices--this has historically been left to the services as they organize, train, and equip forces.[89] In the past a DOD Committee on Excellence in Education helped establish officer-exchange programs among service academies.[90] In response to GAO criticism, in 1992 the previously cited Directorate for Accession Policy, Office of the Assistant Secretary of Defense (Force Management and Personnel) was identified to Congress as DOD's focal point in this matter.[91] Still, even within this context, service programs build on their unique capabilities along with the time and resources available to produce commissioned officers.

If commissioning is seen as one corporate process within DOD, then integrated management makes sense even if execution is decentralized. Alternately, lacking strong oversight, should commissioning programs be viewed as separate entities that produce a similar product? If so, in the business world they would be seen as competitive processes in some sense. Among themselves, military services maintain that commissioning programs are not in competition or truly comparable, but rather have complementary purposes and make unique contributions to producing officers.[92] This position is correct in many ways; it also avoids interservice and intraservice rivalry. Still, some form of competition can spur and guide improvement. Elsewhere in DOD, part of TQM's application is the measurement of performance and costs to enable comparisons between products and to aid in improvement (as in logistics support centers). Further, as GAO and Congressional action have shown, commissioning programs *will* be compared, in a summative external sense if not a formative internal one.

It should be noted that even if commissioning sources were viewed as competing organizations, Deming calls for cooperation. A business analogy is in setting common standards with the customer so continuous improvement can be focused better.[93] Another analogy that might be applied here is the defense industry, where true competition does not exist--it more closely resembles a monopsony-monopoly relationship.[94] Similarly, DOD is the only customer for commissioning programs, and there is no free entry into competition to produce cadets. Thus, any intra-organizational competition would be a "synthetic" one for purposes of improvement, as may occur in multi-source defense contracts.[95]

In fact, true competition should be a "non-issue" since commissioning sources *are* integral parts of DOD, more analogous to corporate divisions. As such, the culture of commissioning may best be served by benchmarking.

Benchmarking supports the collection of evaluative data for formative purposes, and its use by commissioning sources extends to non-service organizations as well as service counterparts. In areas relating to officership, benchmarking naturally stems from other commissioning programs in the US and other nations; in broader leadership training it may include even more organizations. Benchmarking can be a cooperative effort to improve commissioning from all sources. What is needed is a renewed vision of DOD corporateness in commissioning and the establishment of metrics to aid benchmarking, formative evaluation, and cooperation throughout. This vision and these metrics must involve customers, planners, and decision makers at all levels. The issue remains of what kinds of data are needed (input-output, subjective-objective, internal-external, formative-summative) and over what span it should be applied.

Regarding input or output data, GAO has noted that the service academies' entrance criteria place them among the elite of the nation's colleges and universities. For example, in 1988 entrants had average Scholastic Aptitude Test scores ranging from 564-588 (verbal) and 642-668 (math) compared to national averages of 428 and 476, respectively. These scores were paralleled by student records showing leadership potential and athletic aptitude.[96] As noted, though, on the faculty-side of the learning input equation the GAO questioned the credentials of military faculty.[97] Also, in 1991, the GAO termed many output indicators of program effectiveness "inadequate." The GAO noted academy graduates "have higher retention and faster career progression than officers from other commissioning sources," with faster promotion and higher final rank.[98] The GAO concluded, though, that personnel policies favoring academy graduates might invalidate such measures--this is a point disputed by DOD.[99] The GAO also stated that "none of the services was able to provide much

objective data to support their beliefs that their programs were producing outstanding officers"--here DOD concurred.[100] Occasional surveys of supervisory ratings and graduate opinions were faulted for not being systematically conducted or comparable over time.[101] Thus, more data on student learning assessment, program output tied to goals, and long-term benefits is needed.

As in academia, there are a variety of metrics available to commissioning sources for objective evaluation. Examinations, despite limitations, remain standard features, though USAFA and other programs may look more at other types of evaluation (e.g., portfolios, papers, or exercises).[102] Job performance, promotion records, and other personnel data have the benefit of being open or quantifiable to an extent; however, they are not purely objective. Performance records include narrative evaluation that may be inflated for promotional purposes. As noted earlier, job records, advancement statistics, or other personnel data are subject to interpretation and controversy. As such, they are not good metrics from an idealized TQM standpoint--measures that are accepted as meaningful by the customer(s), understandable, unambiguous, and able to drive appropriate action.[103] Developing objective, appropriate metrics has proven to be an ongoing challenge in academia and military educational programs.

As TQM depends on customer perceptions, subjective information has a special place in educational evaluation. Subjective information that impacts commissioning programs has included both anecdotal and formal feedback.[104] USAFA graduates are cited by many as a top source of professionalism and competence. Alternately, civilian educators working with USAFA graduates in advanced programs report that those students had more difficulty orienting to their work than civilian counterparts.[105] They may also be seen as elitist, less mature, or less dedicated to continuous learning. It has been suggested that a lack of

maturity or motivation in USAFA graduates might be linked to disciplinary problems.[106] Similar results have been reported for other academies. West Point graduates, in a 1987 survey, fared well in many areas except traits of maturity, specific job knowledge or skills, and concern for their troops.[107] Quantifying such views while avoiding biases or stereotypes is difficult, but they must be considered in evaluating and improving the commissioning process.

There also are dangers in too much focus on quantification, especially in mandated metrics. The focus in TQM is for internal assessment and formative evaluation while driving out fear of management. This argues that the main focus for commissioning metrics and improvement should be within each program. Yet the GAO has stated that "internal reviews cannot substitute for independent, external oversight."[108] It feels that without such oversight "the Congress and the DOD cannot determine readily how much academy graduates cost or what the Nation is getting for its investment."[109] In part this attitude may stem from a GAO concern that external recommendations by accreditation officials, visiting professors, and the GAO regarding the relative experience of academy faculties or the level of work required of cadets had little independent impact on service academies.[110] Some such concerns might be met by broader internal evaluation, with more common assessment among commissioning sources and with data suitable for both formative and summative purposes. It is the task of program leaders to ensure that valid data linked to educational goals and processes is collected and, even if externally prompted or summative in purpose, is used formatively.

In responding to 1991 GAO recommendations that it needed broader data on quality and performance, DOD argued that rather than tasking the services to perform that task it would do so itself. The Defense Manpower Data Center designed a customer-oriented survey to measure performance, with anticipated

validation of the survey instrument to begin by the summer of 1991. This effort was related to prior GAO studies of the ROTC system, and it was expected to yield results also applicable to other commissioning programs.[111] The survey is still undergoing validation, though, and has not been applied.[112]

Within the Air Force, in 1980 the Occupational Measurement Center created a survey for the CEC. This survey explored skills needed by all new officers, and its results formed the basis of the CEMU. A second survey in 1984 focused on job performance to refine the CEMU. Another survey, first planned for 1992, should be conducted this year--it was developed by Air Training Command with the Occupational Measurement Center to survey officers on active, reserve, and national guard duty concerning the tasks performed by new officers and the knowledge required of them.[113] Along similar lines, USAFA's Department of Behavioral Sciences and Leadership has developed a "behaviorally anchored rating scale" that can help evaluate cadet performance more quantifiably in key areas related to military performance and officership.[114] This survey could be adapted to monitor officers after graduation and strengthen the evaluative link between commissioning programs and career performance. Extending such data throughout the career provides a better evaluation of cost-benefits and long-term performance while providing a link to follow-on professional military education.

With surveys or other needed metrics there is merit in DOD-wide development and application. This would require all commissioning sources to agree on the qualities sought in our newly commissioned officers, objectives of the various commissioning programs, and meaningful metrics at different levels. There are unique aspects and resources in each commissioning program; still, the effort expended in drawing together the community to discuss and develop such metrics for formative as well as summative purposes would be of value itself.

CHAPTER V

CONCLUSIONS

This paper has focused from broad philosophy to specific tools in one exploration of total-quality, total-force commissioning. It has shown that many pressures exist for evaluation and improvement of DOD commissioning programs, pressures internal and external to the programs themselves. It has also been seen that TQM provides a way to meet these two directional pressures, offering opportunities for improvement and integration.

TQM, meshed with traditional concerns for educational development and tailored to commissioning programs, can guide continuous improvement. However, applying TQM principles and practices highlights issues that must be addressed. Among these are defining and measuring quality for broad educational and training goals, defining multiple customers and their requirements as well as multiple products and their priorities, and developing meaningful ways to present data for evaluation to senior decision makers. Each commissioning program has a unique nature and resources, making comparison to civilian or functional counterparts difficult. In this environment, benchmarking seems more applicable than direct competition, either with civilian institutions or with interservice and intraservice counterparts.

In application, this paper has focused on USAFA, but there is a common mission and nature to commissioning programs as they generate officers for initial service through education and training. The application of TQM must be

tailored and explored by commissioning sources just as it is being tailored and explored by US business and government. TQM is not intended to stamp out organizational or personal individuality in the name of standardization. Rather it frees individuality while establishing boundaries and measures for process improvement.[115] In a similar vein, the author does not advocate homogeneous commissioning. Jointness is best recognized as taking advantage of the unique capabilities of each service; this holds true in commissioning programs.

Services can retain the lead in evaluating and integrating their programs for formative development while supporting other summative evaluation. The Air Force has one mechanism for such integration; mechanisms are weaker at the DOD level, but increased coordination has been promised to Congress. Finding appropriate metrics remains a challenge and an opportunity in this process. TQM favors quantitative, output-oriented, internally generated, formative metrics; however, a mix of these with qualitative, input-oriented, externally mandated, and summative metrics is inevitable. Program leaders should try to participate in developing metrics, even mandated ones, and to ensure that the mix of metrics ultimately both serves decision makers and fosters program improvement.

This paper, in focusing from broad issues to specific metrics, highlighted the current use of periodic surveys and the difficulties in finding other needed metrics for ongoing evaluation. In developing such metrics basic questions resurface regarding the structure and possible integration of our education and training programs. The problem is complex and political, and this paper may have provided more survey than solutions. Still, the issues reflected here are some of those that must occupy leaders, planners, and senior decision makers if we are to have programs based on the DOD management system of TQM and integrated in a total-force environment serving the individual and the nation.

APPENDIX I

MISSIONS OF COMMISSIONING PROGRAMS[116]

SERVICE ACADEMIES

1. Air Force

pre-1992: "To provide instruction and experience to all cadets so they graduate with the knowledge, character and motivation essential to leadership as career officers in the United States Air Force."

1992 proposal: "To develop and inspire air and space leaders with vision for tomorrow."

2. Navy

"To develop midshipmen morally, mentally, and physically and to imbue them with the highest ideals of duty, honor, and loyalty in order to provide graduates who are dedicated to a career of naval service and have potential for future development in mind and character to assume the highest responsibilities of command, citizenship, and government."

3. Army

"To educate and train the Corps of Cadets so that each graduate shall have the attributes essential to professional growth as an officer of the Regular Army, and to inspire each to a lifetime of service to the nation."

AIR FORCE RESERVE OFFICER TRAINING CORPS

"To provide instruction and experience to all cadets in a diversified college or university environment so they will graduate with the knowledge, character and motivation essential to become warrior leaders in the US Air Force."

AIR FORCE OFFICER TRAINING SCHOOL

"To lead, train, motivate and commission candidates as officers in response to US Air Force, Air National Guard, and US Air Force Reserve requirements."

APPENDIX II

W. EDWARDS DEMING'S 14 POINTS FOR TOTAL QUALITY MANAGEMENT[117]

1. Create constancy of purpose toward improvement of product and service, with the aim to stay in competitive business and to provide jobs.

2. Adopt the new philosophy. Become intolerant of commonly accepted levels of delays, mistakes, defective materials, and defective workmanship. Do not accept bureaucratic size or inertia as an excuse.

3. Stop depending on mass inspection to achieve quality. Require, instead, statistical evidence that quality is built into the process.

4. Stop awarding business on the basis of its price tag alone. Find meaningful measures of total value and seek to build long-term relations of loyalty and trust with suppliers.

5. Improve constantly and forever the system of production and service. Find problems--it is management's job to work continually with workers on the system to reduce waste and improve quality.

6. Institute modern methods of training on the job.

7. Institute leadership and modern methods of supervision aimed at helping people do a better job.

8. Drive out fear, so that everyone may work effectively for the company. Replace external motivators with internal ones.

9. Break down barriers between departments or staff areas. Enhance communications and replace destructive competition or conflicting goals with teamwork towards the common goal.

10. Eliminate arbitrary numerical goals, posters, and slogans for the workforce, or asking for new levels of productivity without providing methods.

11. Eliminate work standards that prescribe numerical quotas. Substitute leadership and stress quality over numbers.

12. Remove barriers that stand between the worker (engineer, manager, etc.) and the right to pride in workmanship.

13. Institute a vigorous program of education, training, and self-improvement to include TQM philosophy and methods.

14. Create a structure of top management that will lead by example while making the TQM transformation everyone's job, every day.

APPENDIX III

JOSEPH M. JURAN'S 10 STEPS TO QUALITY IMPROVEMENT[118]

1. Build awareness of the need and opportunity for improvement.
2. Set goals for improvement.
3. Organize to reach the goals (establish a quality council, identify problems, select projects, appoint teams, and designate facilitators).
4. Provide training.
5. Carry out projects to solve problems.
6. Report progress.
7. Give recognition.
8. Communicate results.
9. Keep score.
10. Maintain momentum by making annual improvement part of the regular systems and processes of the company.

APPENDIX IV

PHILIP B. CROSBY'S 14 PRINCIPLES OR STEPS TO QUALITY IMPROVEMENT[119]

1. Management Commitment. Make it clear that management is committed to quality.

2. Quality Improvement Teams. Form teams with representatives from each department.

3. Measurement. Determine where current and potential quality problems lie.

4. Cost of Quality. Evaluate the cost of quality and explain its use as a management tool.

5. Quality Awareness. Raise the quality awareness and personal concern of all employees.

6. Corrective action. Take actions to correct problems identified in previous steps.

7. Zero Defects Planning. Establish a committee for the zero defects programs. [Apply zero defects concepts as a common goal, to be sought by continuous improvement, rather than as a motivational and assessment program.]

8. Employee Education. Train supervisors and all employees to actively carry out their part of the quality improvement program.

9. Zero Defects Day. Hold a "zero defects day" to let all employees realize that there has been a change.

10. Goal Setting. Encourage individuals to establish improvement goals for themselves and their groups.

11. Error Cause Removal. Encourage employees to communicate to management the obstacles they face in attaining their improvement goals.

12. Recognition. Recognize and appreciate those who participate.

13. Quality Councils. Establish quality councils to communicate on a regular basis.

14. Do It All Over Again. Emphasize that the quality improvement process never ends.

APPENDIX V

WILLIAM E. CONWAY'S 6 TOOLS FOR QUALITY IMPROVEMENT[120]

1. Human relations skills--the responsibility of management to create at every level, among all employees, the motivation and training to make necessary improvements in the organization.

2. Statistical surveys--the gathering of data about customers (internal as well as external), employees, technology and equipment, to be used as a measure for future progress and to identify what needs to be done.

3. Simple statistical techniques--clear charts and diagrams that help identify problems, track work flow, gauge progress, and indicate solutions.

4. Statistical process control--the statistical charting of a process, whether manufacturing or non-manufacturing, to help identify and reduce variation.

5. Imagineering--a key concept in problem solving, involving the visualization of a process, procedure, or operation with all waste eliminated.

6. Industrial engineering--common techniques of pacing, work simplification, methods analysis, plant layout and material handling to achieve improvement.

APPENDIX VI

MICHAEL E. MILAKOVICH'S ELEMENTS OF TQM IN PUBLIC SERVICE[121]

1. Customer satisfaction is the primary goal and ultimate measure of quality in any public service organization.

2. The definition of *customer* is broadened to include both those internal to the organization (for example, employees in other departments) and those external to the organization (vendors, taxpayers, contractors, regulators, suppliers).

3. Everyone must share a common vision of the mission of the organization based on extended customer requirements.

4. Senior elected and appointed leaders must communicate a long-term commitment to all customers, reward teamwork, and encourage process improvement efforts at all levels.

5. Expanded training and self-improvement opportunities in leadership skills must be offered to meet or exceed valid customer requirements.

6. Individual involvement must be ensured by establishing process improvement teams.

7. Employee loyalty, trust, and teamwork must be recognized, supported, and acknowledged.

8. Fear of change must be eliminated, and other barriers to the development of pride in service must be removed.

9. Everyone must be provided with the tools and training needed to function in accordance with extended customer requirements.

10. Senior elected and appointed officials must make the necessary changes in public organizations for successful implementation of the preceding goals to become possible.

APPENDIX VII

ONE COMPARISON OF CLASSIC EDUCATIONAL ASSESSMENT AND TQM[122]

Assessment Emphasizes	TQM Emphasizes
Goals	Vision
Iterative	Continuous
Talk to Students	Close to Customers
Collaboration	Teamwork
Done by Faculty	Faculty and Students Responsible for Process
Focus on Outcomes	Start with Process
Data-driven	Data-driven

NOTES:

Both educational assessment and TQM are shown as data-driven.

Chaffee and Ewell, in comments on this comparison, agree that TQM offers a broader scope than traditional assessment.

Elsewhere, Ewell has noted other parallels in TQM and assessment practices such as (flowcharting - curricular mapping) or (sampling - portfolio evaluation).[123]

APPENDIX VIII

SOME AREAS USED IN ASSESSMENT AND EVALUATION[124]

- Program costs (total, per student, by program, etc.)
- Efficiency of administrative support or procedures
- Size or nature of facilities (library, labs, classrooms, gyms, etc.)
- Availability of computers, media, or other equipment
- Student-teacher ratio
- Lab-lecture teaching format ratio
- Population characteristics: class size, sex, race, minority representation, regional origins, etc.
- Incoming standardized test scores (SAT, ACT, etc.) or other achievements
- Number of faculty PhDs, Nobel laureates, or endowed chairs
- Faculty research programs, grants and funding levels
- Faculty research results and renown or awards
- Number of faculty publications and citations of their publications by other scholars
- Instructor characteristics: who teaches (teaching assistants or professors), training and experience levels, time in class, availability for tutoring
- Teaching style and technique of instructors
- Responsiveness of teachers to students (extra instruction, time taken to give feedback on assignments, etc.)
- Curriculum design and course offerings
- Course and graduation requirements
- Course materials (tests, handouts, etc.), texts, and reading assignments
- Existence of collocated undergraduate and graduate programs
- Cooperative or collaborative programs with other institutions
- Number and type of enrichment programs offered
- Involvement and levels of performance of students in enrichment programs (research, athletics, social, community, etc.)
- Number of returning freshmen (an interim measure)
- Grades and other performance measures in each course
- Student portfolios or other compilations of work during student career
- National honors and recognition of students
- Performance and relative placement of students in scholastic competitions
- Student learning-related behaviors, disciplinary problems, etc.
- Specific tests of behaviors: critical thinking, attitudes, values, etc.
- Entry, interim, exit, post-exit, and special surveys or interviews (students, faculty, alumni, supervisors, external experts, etc.)
- Anecdotal information and feedback
- Number of graduates, percent completion, and time-to-completion
- Number and types of degrees attained by students, grades at completion, disciplinary and non-disciplinary majors obtained, etc.
- Standardized exit test scores (in capstone courses, on GRE, etc.)
- National awards and scholarships earned by graduating students
- Levels and prestige of graduate school acceptances for students
- Job placement and time-to-placement, level of job placement, and initial salaries of graduates
- Long-term job promotion, awards, and professional achievement of graduates
- Institutional or departmental rankings and accreditation, regional or national

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GLOSSARY

CEC	Commissioning Education Committee
CEMU	Commissioning Education Memorandum of Understanding
DOD	Department of Defense
GAO	General Accounting Office
OCS	Officer Candidate School
OTS	Officer Training School
ROTC	Reserve Officer Training Corps
USAFA	US Air Force Academy